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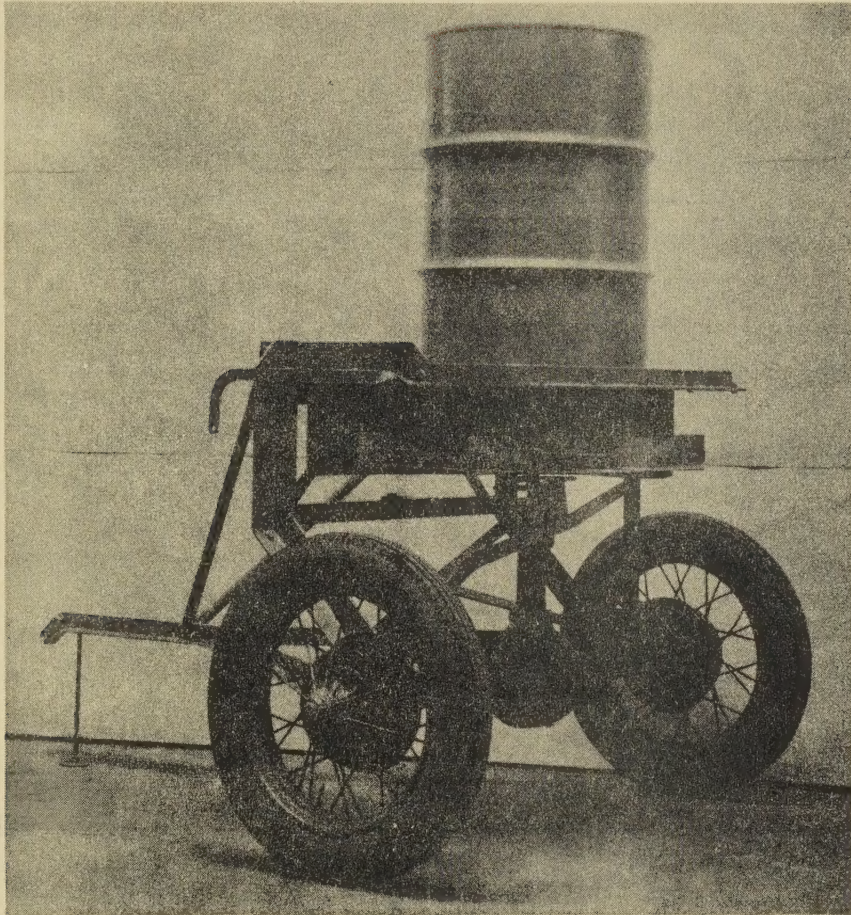
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POISON BAIT SPREADER

FOR

GRASSHOPPER CONTROL

APR 15 1939



U. S. Department of Agriculture

Bureaus of
Agricultural Engineering
and
Entomology and Plant Quarantine
cooperating

It has become evident in recent years that a standardized mechanical poison bait distributor is needed to aid effectively in reducing the ravages of grasshoppers. Accordingly investigations were inaugurated during the past year to expedite the development of such a device. Observations of field equipment were made throughout the entire infested area with a view to selecting such features as appeared promising, and combining them with such other ideas as were felt necessary, into the design of a simple effective machine. Such a machine is herein described.

No particular originality is claimed for the design of this machine, many of the features incorporated being adaptations from machines developed by others in the infested States although ideas resulting from tests in the shop and field were drawn upon freely.

Procedure

Study carefully the details of construction and the accompanying drawings in making and assembling the machine.

Automobile rear axle assembly:

Select an automobile rear axle assembly having a torque tube drive and spline at front end of drive shaft. Make certain that the gears, bearings, etc., are in reasonably good condition. Secure female spline from universal joint which matches with the male spline at end of the drive shaft. Wheels for assembly should be fitted with serviceable tires.

Cut the torque tube off 17-3/4 inches from center of axle housing as shown on sheet G.

Shorten drive shaft to 21 inches from center of axle housing, using male spline at outer end. To do this, first measure the distance the end of drive shaft extends from center of the axle housing and subtract 21 inches; the remainder will be the length of section necessary to cut out from middle of shaft, leaving two stub shafts of about equal lengths to make up the required 21 inches when joined. One of these stub shafts will be the end extending from the differential, and the other, the piece with the male spline. On all assemblies having a solid drive shaft, the two ends of the stub shafts can best be joined by making a sleeve 4 inches long to slip the cut ends into, then weld at both ends of the sleeve. On other makes of assemblies having a spline near the differential, the drive shaft can be shortened at the rear end, using the spline sleeve to join the two sections. Check alignment of shaft after shortening and straighten, if necessary.

Important: The rear axle assembly must be so attached that in normal operation the wheels will move in a direction opposite to that required for forward travel in the automobile from which taken. This makes the spreader disk turn counter-clockwise when viewed from above.

Construction of parts:

Cut out, shape and drill the parts as indicated in drawings. The over-all dimensions of the pieces required for the different parts are given in the bill of materials. Allowance has been made for cutting and shaping. Lay out the parts to avoid waste of material.

Care must be exercised in making up the side angles. A section of the angle leg is cut out for each bend, the angles heated at these points and bent to shape. The cut edges are then welded together. Welding may pull the sides out of alignment so that they must be measured and if necessary reheated and brought to the proper angle. Each bend must be to the same angle, as shown on Sheet G.

The spreader flange shown on sheet E is made up by welding the section of female spline to one side of the $3/8 \times 6$ " round plate and the squared socket to the other side. This squared socket can best be made by boring a $7/8$ " hole in the piece to the proper depth, then heating and driving the squared end of the agitator shaft into the hole and shaping so that the shaft has about a $1/16$ inch clearance. This loose fit is necessary to prevent the action of the shaft in the upper bearing from lifting the spreader flange off the male spline.

Assembling the parts:

It is very important to follow the order of procedure here stated in assembling parts.

Use lock washers on all bolts except where lock nuts are used. The bolt holes should be bored of the sizes indicated on the accompanying drawings.

Weld side plates to the long leg of side angles as indicated; also weld vertical angle to right side angle and side plate as shown on sheet G. No vertical angle is used on the left side.

Weld upper bearing to feed table, allowing bearing to extend through top of table $1/4$ inch and weld from top only. Have the bearing placed with hole for Zerk fitting to rear.

Pour babbit lining in upper bearing to fit agitator shaft. Before pouring, make certain that the shaft is in center, also screw a plug into hole for Zerk fitting. After pouring babbit, remove plug from Zerk fitting and drill oil hole. Cut grease retaining groove in babbit lining.

Place feed control over lower end of upper bearing on under side of feed table. Secure feed control to feed table by $3/8$ inch bolt through top of feed table and slotted hole in feed control, using flat washers and lock nuts, adjusted to permit feed control to move freely.

Weld clips to under side of feed table at points indicated in drawings.

Weld shield bottom to shield as directed on Sheet F of drawings.

Weld shield to under side of feed table along scribed lines.

Weld extension shield to under side of feed table and along edge of shield.

Bolt table side angles and table rear angle in place on top of feed table with $3/8$ inch bolts, at the same time bolting feed control support over arm of feed control, using flat washers as spacers to allow arm to slide freely.

Weld ends of table side angles to table rear angle.

Rivet spreader blades to spreader disk, with cleaning blades on opposite side, using $1/4$ soft rivets.

Bolt spreader disk to spreader flange with $3/8$ inch bolts inserted from bottom.

Assemble frame parts in the following order: Bolt upper cross angle and lower cross angle to side angles with $1/2$ inch bolts, attach diagonal braces to the two cross angles with $1/2$ inch bolts inserted from rear. Bolt the two cross angles to sloping sections of side angles with $1/2$ inch bolts, bolt cross angles together in center with $1/2$ inch bolt, slide feed table assembly between side plates and bolt to side plates and upper cross angle using $1/2$ inch bolts in all holes, except the three holes through feed table and upper cross angle, where $3/8$ inch bolts are used. Attach the housing angles to bottom of side angles with $5/8$ inch bolts. The vertical legs of housing angles must be on outside and hole for drawbar to front.

Set assembled frame on rear axle housing, with the housing angles fitting over axle housings, 21 inches from center of differential.

Bolt torque tube brace to lower cross angle and place rear end against right side of torque tube.

Carefully align drive shaft and upper bearing, keeping them in alignment during the next two welding operations.

Weld torque tube brace to right side of torque tube.

Weld housing angles to axle housing. Caution: Start welding at top of housing and weld a short distance at a time, each way, to prevent pulling housing out of alignment. Make sure housing angles are welded securely to axle housing. If an acetylene torch is used for welding, the axle bearings should be protected from excessive heating.

Weld throwout holder to rear of torque tube as shown on Sheet G.

Pack torque tube and pour babbitt lining for end of drive shaft, making a bearing about 2-1/2 inches long. Take care, in packing, to prevent melted babbitt from running through to lower bearings.

Remove torque tube from drive shaft or vice versa, depending upon make of rear axle assembly. Clean all packing from beneath babbitt bearing.

Drill and tap for Zerk fitting on left side of torque tube. Cut grease retaining grooves in babbitt bearing.

Reassemble rear axle assembly. Attach throwout lever to vertical angle on right side by 1/2 inch bolt, using lock nuts. Put feed latch in place by sliding handle through slot in left side angle, and bolt rear end on top of feed control arm. Use bolt with lock nuts to connect feed latch to feed control arm.

Place spreader disk in position with female spline fitting over male spline of drive shaft. Insert agitator shaft through top bearing into squared socket of spreader flange and bolt in place. The agitator blade should have about 5/8 inch clearance above feed table.

Place steel barrel, with both ends cut out, on top of feed table. Center the barrel around agitator shaft, along scribed line. Weld barrel securely to feed table at least six points.

A standing platform may be an advantage when filling the barrel. This can be easily provided by bolting a couple of short lengths of planking across the top of drawbar angles.

Adjustments and operation

The height of hitch can be varied by bolting the front end of the drawbar braces in different holes along the drawbar. The machine should be operated with the spreader disk in a horizontal plane.

The feed is regulated by adjusting the feed latch on the left side. A stop pin is provided to facilitate adjustment, after once determining the proper opening. The latch should be set to about the half open adjustment to feed 20 pounds to the acre with a forward speed of 10 miles per hour. Several factors may influence the rate of feed, including the condition of bait material, the forward speed of the machine, action of the agitator and the size of feed openings.

Caution: In spreading bait the feed ports in the bottom of the bait barrel should be closed before a stop is made and not opened until the machine is well in motion. This will prevent bait accumulating on the spreader disc and being thrown therefrom in lumps due to the slow motion of the disc during stopping and starting.

The throwout lever, when raised, lifts the spreader disk assembly disengaging the splines, thus throwing the spreader and agitator mechanism out of gear. This mechanism is held disengaged, by swinging the throwout lever to the front and allowing it to rest on the top of the torque tube. A throwout mechanism is very desirable for moving the machine from one location to another.

Never throw the spreader mechanism in or out of gear while the machine is in motion.

The bearings should be lubricated frequently, as well as the spline and squared socket.

The recommended speed for operating the machine is about ten miles per hour.

BILL OF MATERIALS

<u>Part Name and No.</u>		<u>Material</u>	<u>Amount Required</u>
Drawbar	A-1	2 x 2 x 1/4 Angle	Two - 70 inches
Vertical Brace	B-9	2 x 2 x 1/4 Angle	One - 28-3/16 inches
Upper Cross Angle	B-10	2 x 2 x 1/4 Angle	One - 41-1/2 "
Lower Cross Angle	C-11	2 x 2 x 1/4 Angle	One - 41-1/2 "
Table Side Angle R	C-14	2 x 2 x 1/4 Angle	One - 32 "
Table Side Angle L	C-15	2 x 2 x 1/4 Angle	One - 32 "
Table Rear Angle	C-17	2 x 2 x 1/4 Angle	One - 36 "
Housing Angle, R	A-4	3 x 3 x 5/16 Angle	One - 12 "
Housing Angle, L	A-5	3 x 3 x 5/16 Angle	One - 12 "
Side Angle, L	B-6	3 x 3 x 5/16 Angle	One - 47-3/16 "
Side Angle, R	B-7	3 x 3 x 5/16 Angle	One - 47-3/16 "
Side Plate	B-8	1/4 x 4 Flat	Two - 21 "
Clevis	A-2	3/8 x 2 Flat	One - 10-1/2 "
Cross Brace	C-13	1/4 x 1-1/2 Flat	Two - 43-3/4 "
Diagonal Brace	C-16	1/4 x 1-1/2 Flat	Two - 18-1/2 "
Feed Control			
Support	C-18	1/4 x 1-1/4 Flat	One - 9-1/2 "
Feed Latch	F-31	1/4 x 1-1/4 Flat	One - 31-1/2 "
Throwout Holder	F-32	1/4 x 1-1/4 Flat	One - 12 "
Agitator	F-28	1/4 x 1-1/4 Flat	One - 11-1/8 "
		Shafting	One - 8 "
Torque Tube Brace	C-12	3/8 x 1-1/2 Flat	One - 20-1/4 "
Throwout	F-33	3/8 x 1-1/2 Flat	One - 38-1/4 "
		3/8 x 6 Flat	One - 6 "
		3/8 x 6 Flat	One - 3-7/8 "
Spreader Flange	E-26	3/8 x 6 Flat	One - 6 D "
		1-1/2 Shafting	One - 1-3/4 "
		Female Spline	One "
Drawbar Brace	A-3	1" Std. Pipe	Two - 46 "
Upper Bearing	D-22	1-1/2" Std. Pipe	One - 2 "
Feed Table	D-19	12 Ga. Sheet	One - 36 x 34 "
Feed Control	D-20	12 Ga. Sheet	One - 11-1/2 x 31 "
Clips	D-21	12 Ga. Sheet	Two - 2 x 2 "

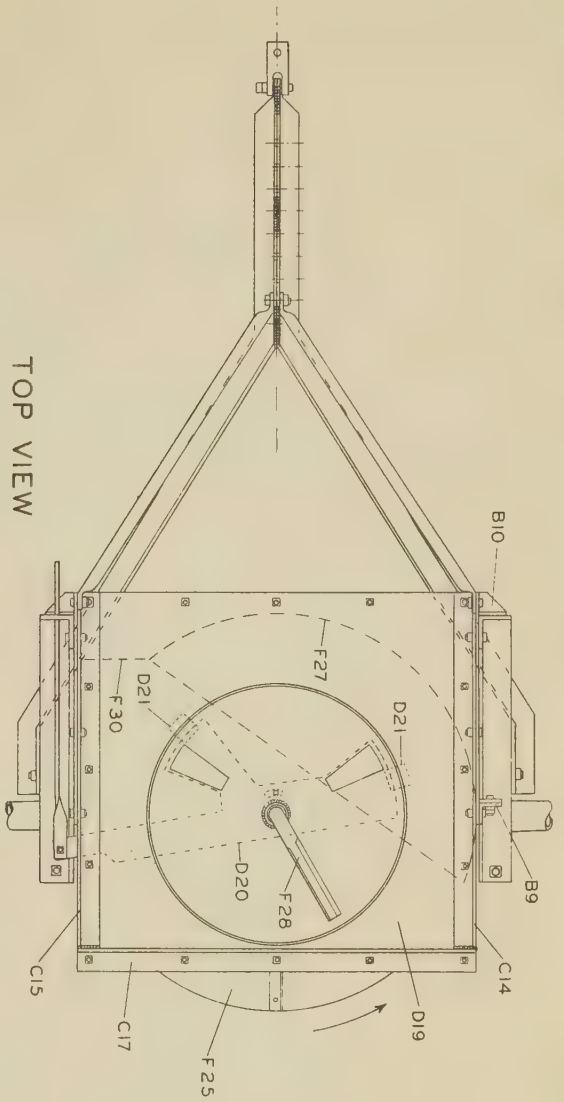
BILL OF MATERIALS (Cont'd)

<u>Part Name and No.</u>	<u>Material</u>	<u>Amount Required</u>
Shield F-27	12 Ga. Sheet	One - 9 x 46-1/2 inches
Shield Bottom F-29	12 Ga. Sheet	One - 12-7/8x34-1/4 "
Shield Estension F-30	12 Ga. Sheet	One - 6-3/4 x 9 "
Spreader Disk E-25	14 Ga. Sheet	One - 35 D "
Spreader Blade E-23	14 Ga. Sheet	Six - 4 x 16 "
Cleaning Blade E-24	14 Ga. Sheet	Six - 1-1/2 x 12 "
Machine Bolts	5/8 x 1-1/2	6
" "	5/8 x 3	1
" "	1/2 x 1-1/4	21
" "	1/2 x 1-1/2	3
" "	1/2 x 2	2
" "	3/8 x 1	19
" "	3/8 x 1-1/2	3
" "	5/16 x 2	1
Lock Nuts	5/8	1
" "	1/2	2
Lock Washers	5/8	6
" "	1/2	25
" "	3/8	20
Flat Washers	1/2	3
" "	3/8	3
Rivots	1/4 x 1/2	18
Cotter pin	3/16 x 1	1
Zerk Fittings	1/8	2
Babbitt metal		3 to 5 lbs.
Steel drum	55 gallon	1

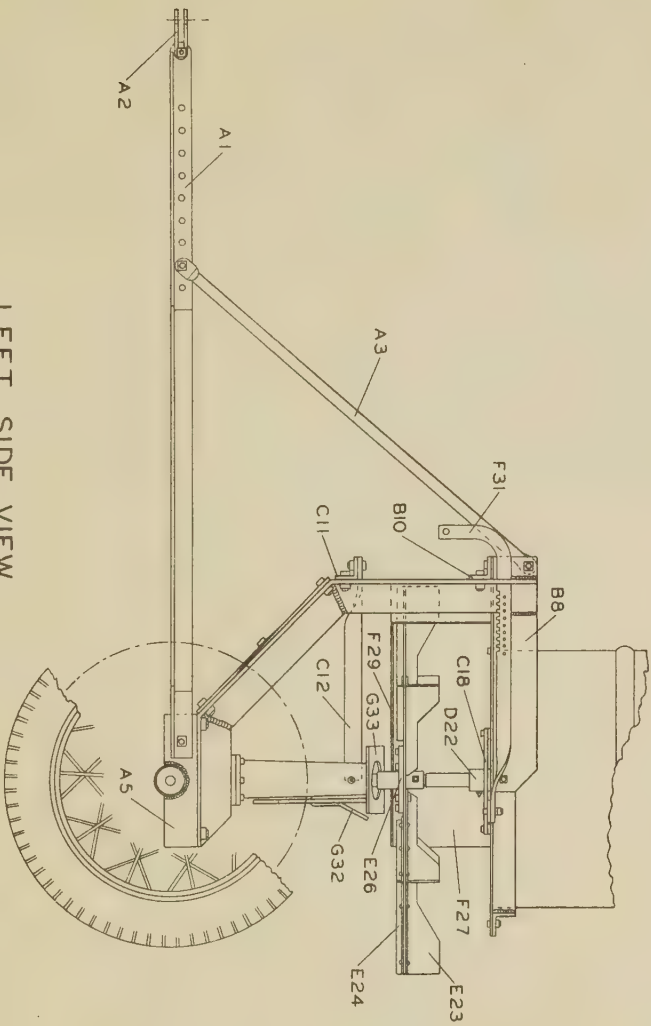
Automobile rear axle assembly
with torque tube drive and
spline on end of shaft.

Total amounts of each different size of steel required before cutting.

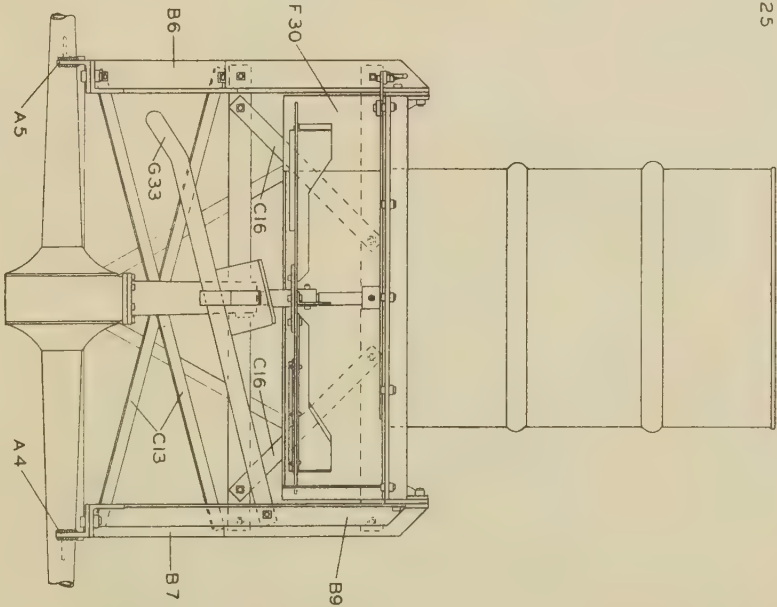
2 x 2 x 1/4 angle	30 feet
3 x 3 x 5/16 angle	10 feet
1/4 x 4 flat	42 inches
3/8 x 2 flat	10-1/2 inches
1/4 x 1-1/2 flat	10 ft. 6 inches
1/4 x 1-1/4 flat	5 feet 6 inches
3/8 x 1-1/2 flat	59 inches
3/8 x 6 flat	16 inches
1-1/2 round	1-3/4 inches
12 ga. sheet iron, black	36 x 84 inches
14 ga. sheet iron, galvanized	36 x 48 inches
1 inch standard pipe	7 ft. 8 inches
1-1/2 inch standard pipe	2 inches



TOP VIEW

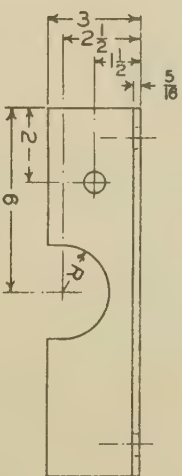
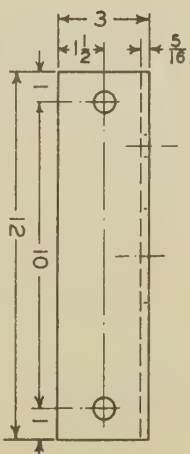
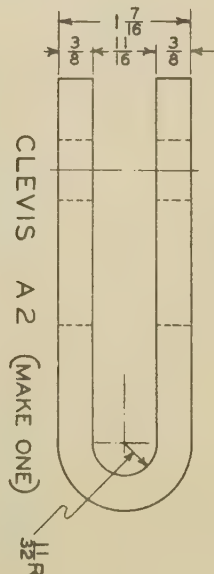


LEFT SIDE VIEW



REAR VIEW

BAIT SPREADER
ASSEMBLY



HOUSING ANGLE A 4 RIGHT A 5 LEFT
RIGHT SHOWN HOLES $\frac{1}{2}$ AND
MAKE R EQUAL TO HALF DIAMETER OF
REAR AXLE HOUSING MEASURE DIAMETER
21 INCHES FROM CENTER OF DIFFERENTIAL
(MAKE ONE RIGHT & ONE LEFT)

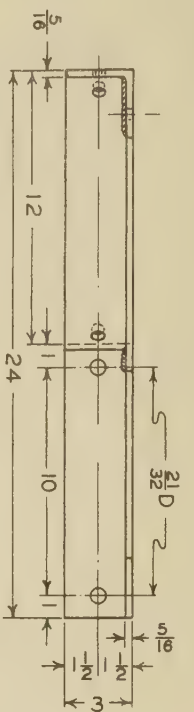


DRAWBAR BRACE A 3 (MAKE TWO)

HOLE¹⁷_{32D}

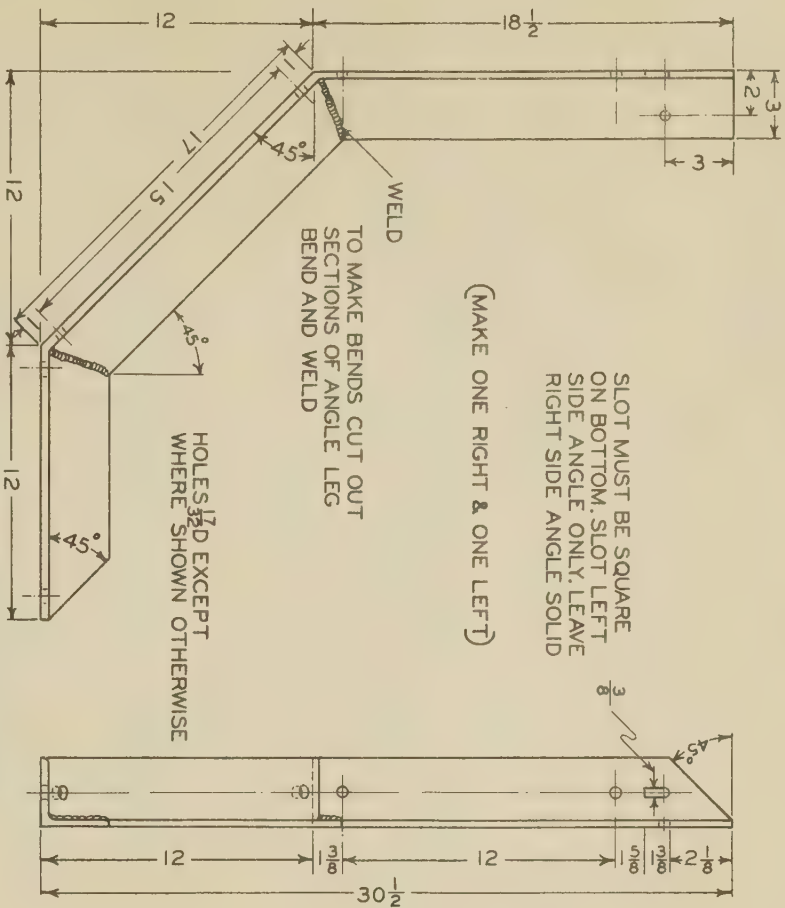
BRACE ENDS ROUNDED TO $\frac{7}{8}$ RADIUS

BAIT SPREADER
SHEET A



SLOT MUST BE SQUARE
ON BOTTOM. SLOT LEFT
SIDE ANGLE ONLY. LEAVE
RIGHT SIDE ANGLE SOLID

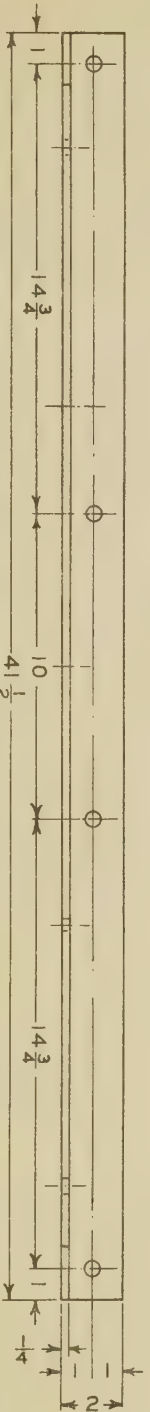
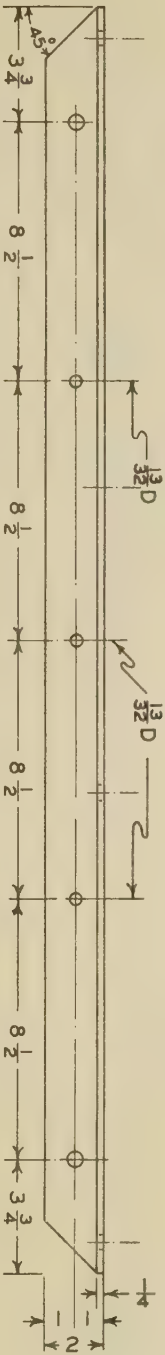
(MAKE ONE RIGHT & ONE LEFT)



WELD
TO MAKE BENDS CUT OUT
SECTIONS OF ANGLE LEG
BEND AND WELD

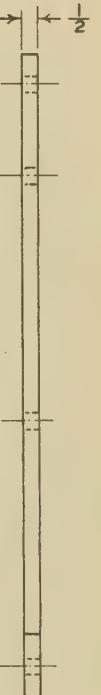
HOLES 17/32 D EXCEPT
WHERE SHOWN OTHERWISE

SIDE ANGLE B6 LEFT B7 RIGHT LEFT SHOWN



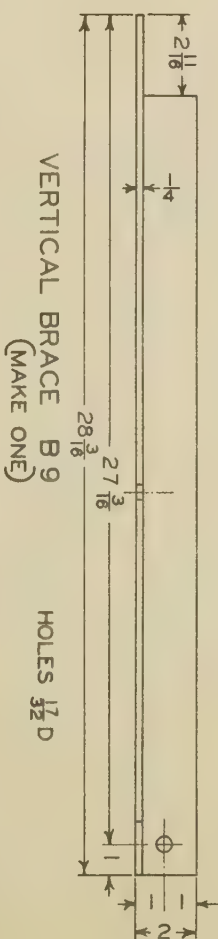
UPPER CROSS ANGLE B10 (MAKE ONE)

HOLES 17/32 D EXCEPT WHERE SHOWN OTHERWISE



SIDE PLATE B8
(MAKE TWO)

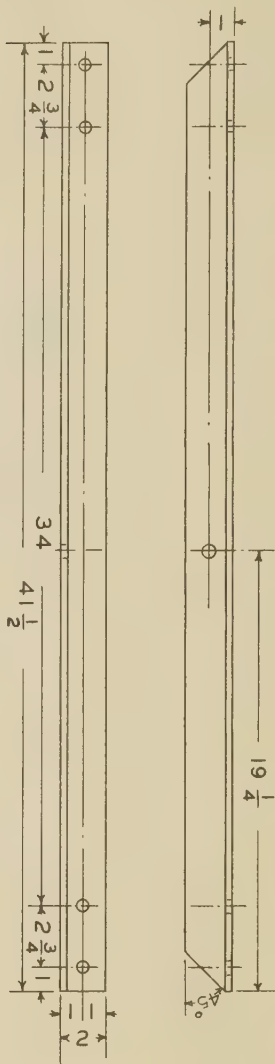
HOLES 17/32 D



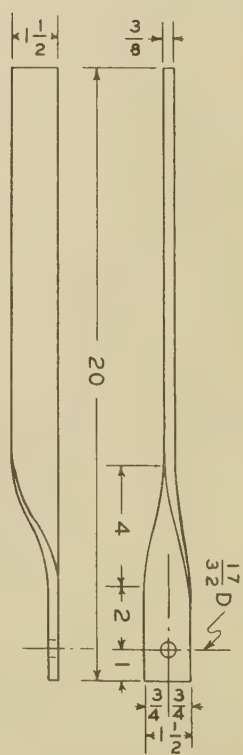
VERTICAL BRACE B9
(MAKE ONE)

HOLES 17/32 D

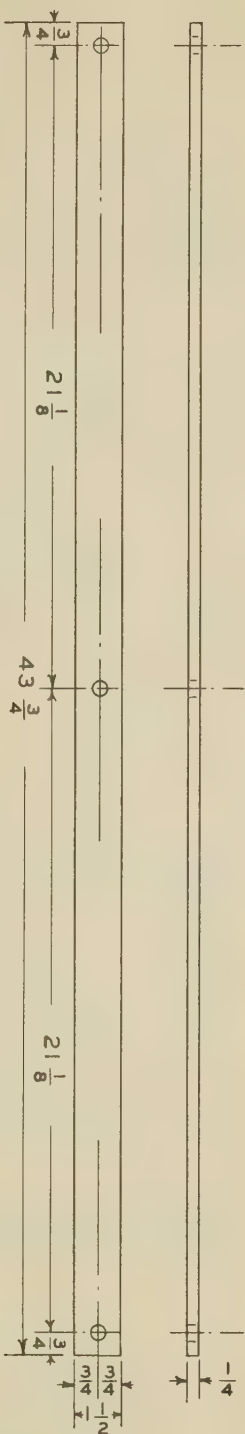
BAIT SPREADER
SHEET B



LOWER CROSS ANGLE C11
(MAKE ONE) HOLES $\frac{17}{32}$ D



TORQUE TUBE BRACE C12
(MAKE ONE)



CROSS BRACE C13 HOLES $\frac{17}{32}$ D (MAKE TWO)

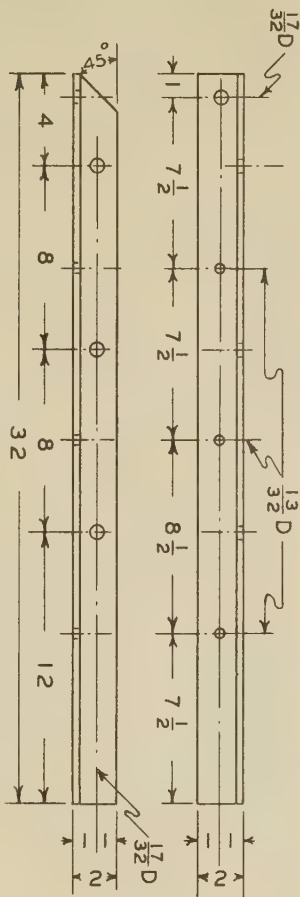
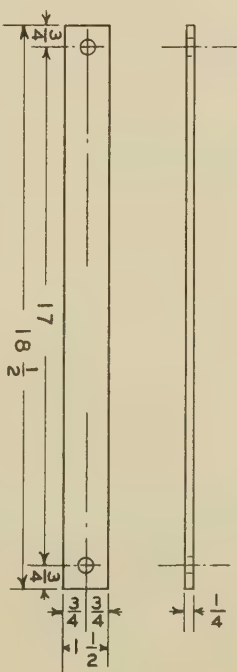


TABLE SIDE ANGLE C14 RIGHT C15 LEFT
(MAKE ONE RIGHT & ONE LEFT)



DIAGONAL BRACE C16 HOLES $\frac{17}{32}$ D (MAKE TWO)

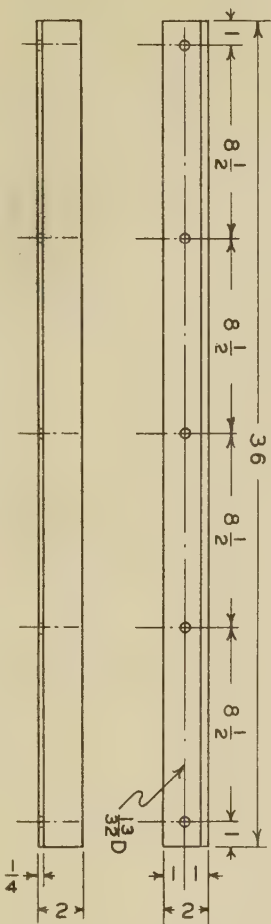
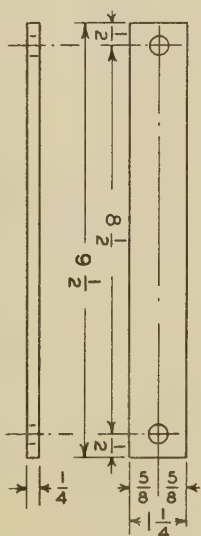
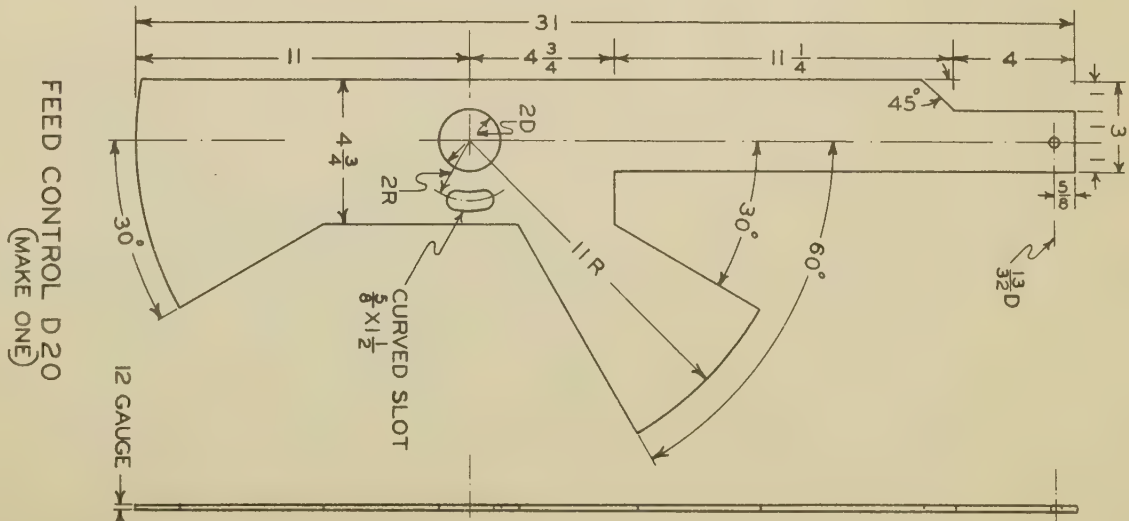
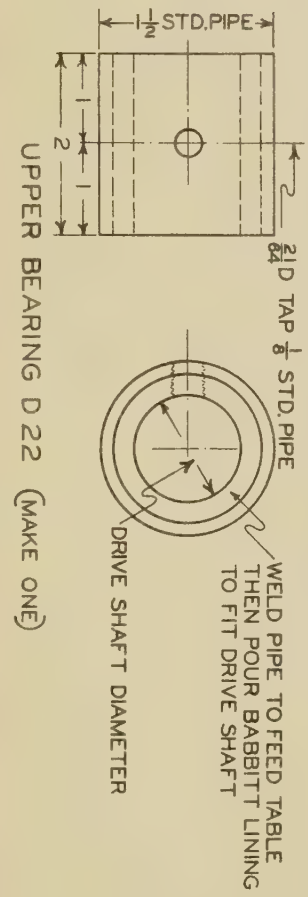
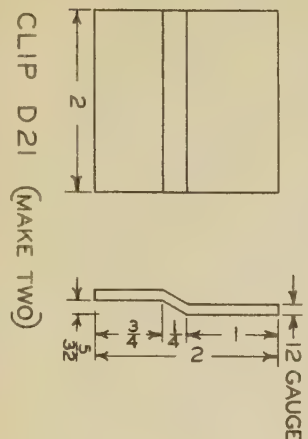
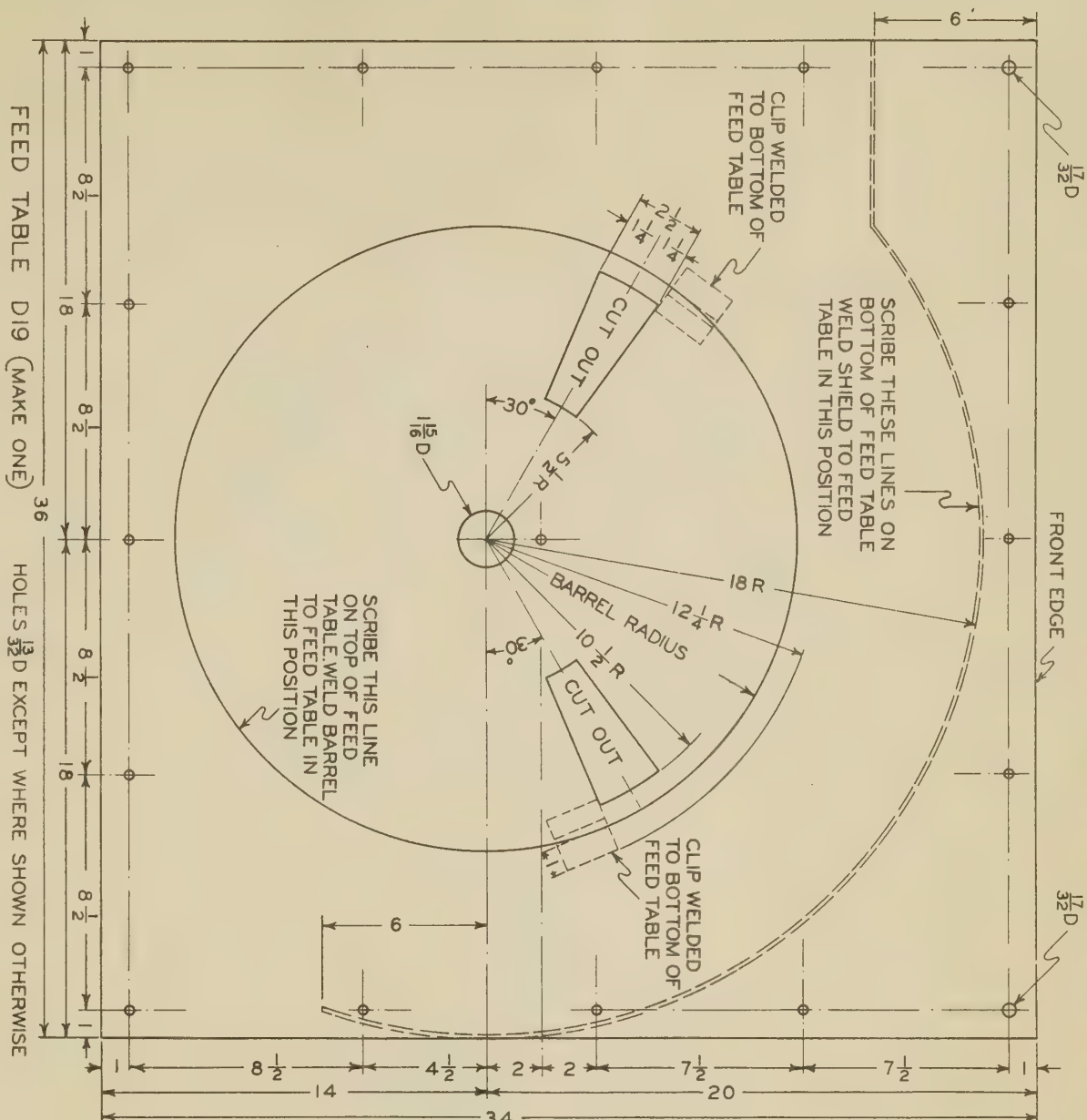
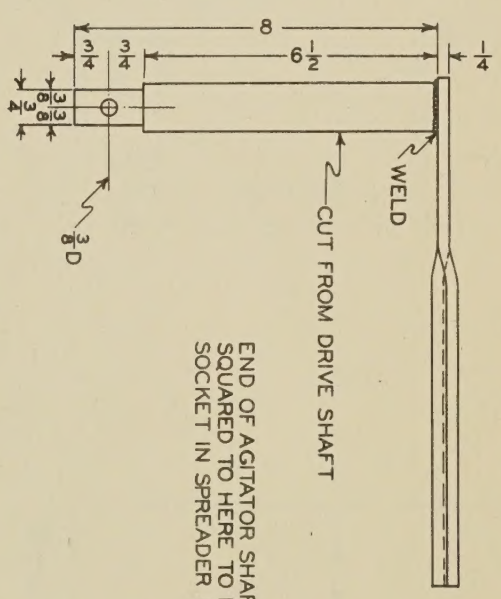
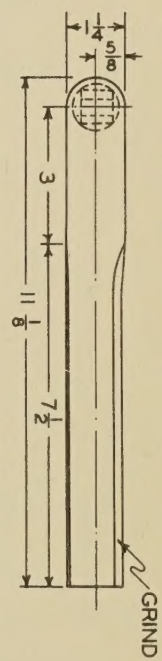
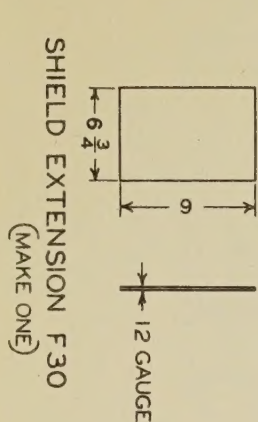
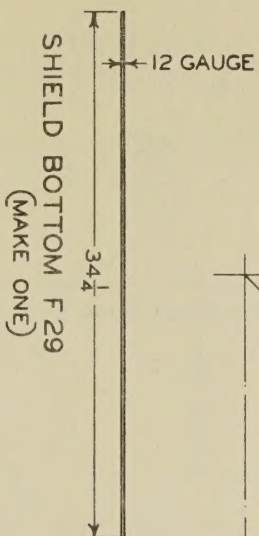
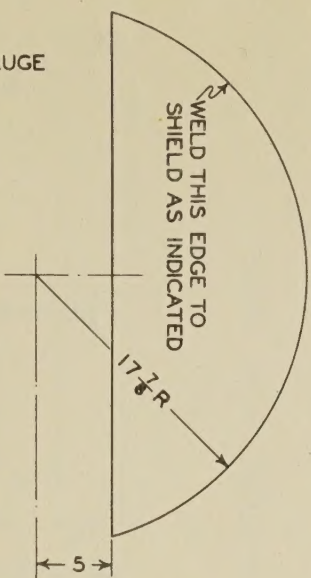
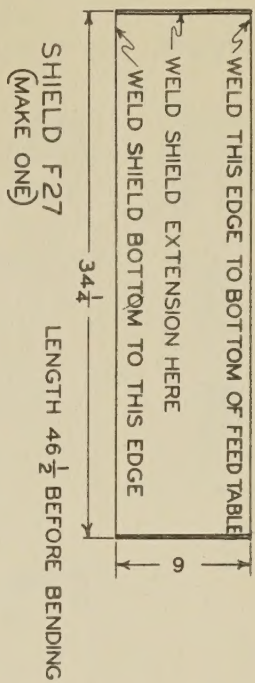
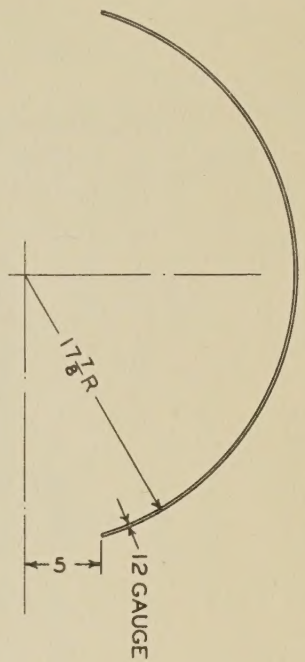


TABLE REAR ANGLE C17 (MAKE ONE)

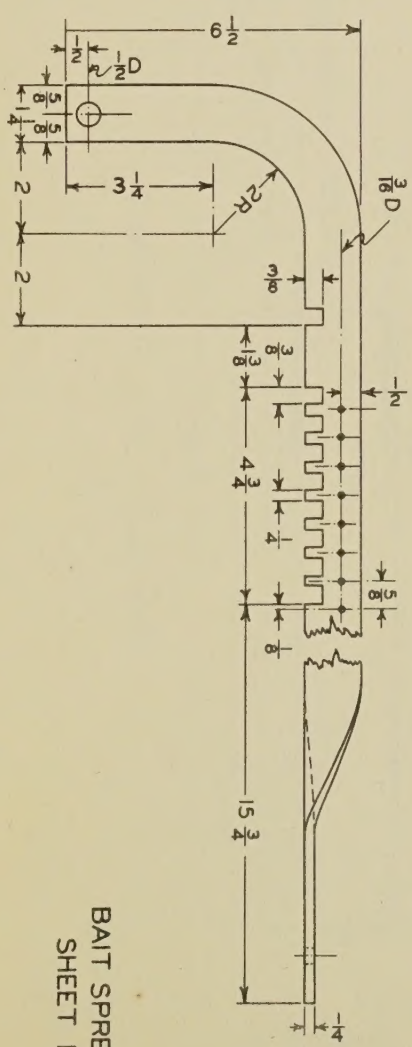
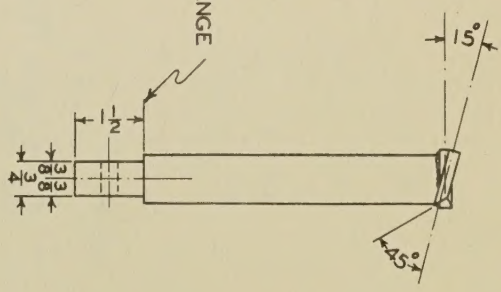
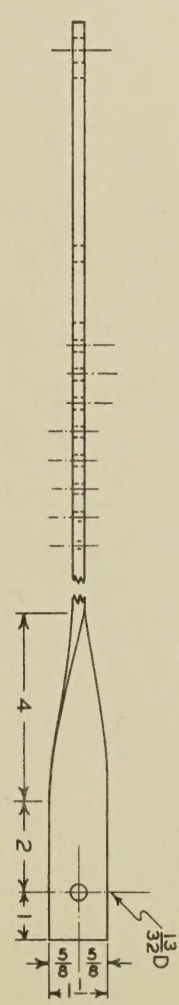


FEED CONTROL SUPPORT C18
(MAKE ONE) HOLES $\frac{13}{32}$ D





AGITATOR F28 (MAKE ONE)



FEED LATCH F31 (MAKE ONE)

BAIT SPREADER SHEET F

